July 13, 2012

2012 Washington State Energy Code SBEIS Appendix A

Costs & Energy Impacts of 2012 Energy Code Significant cost impacts: pages 1-3

For IECC Climate Zones 4 & 5, as compared with current (2009) WSEC

Section	Changes with Significant Cost	Construction Cost Impacts	Energy Savings	Building Types	Trades Impacted
Section C403.2.12.2	Large volume fan systems: Removes exception that has allowed hospitals and labs to use constant volume systems	**+** $3/SF (by proponent, based on built projects)	**+** $1/SF/YR (by proponent, based on modeling)	Hospitals and labs	HVAC
Tables C402.1.2 & C402.2	Envelope requirements: Increases required R-value of continuous insulation on metal stud walls from R-7.5 to R-10, and on commercial wood framed walls from R-21 to either (R-13 + R-7.5) or (R-20 + R-3.8)	+ $0.25 - $0.30 / SF cost for additional insulation thickness and possible smaller mech system sizing	+ $0.05 / SF / YR (estimate by proponent)	All	Insulation
Section C408.2	Commissioning: Eliminates size threshold for commissioning requirement (480,000 btuh cooling and 600,000 btuh heating)	+ Commissioning required for smaller buildings	+ Commissioning is slightly more expensive per square foot for smaller buildings	Smaller buildings	HVAC electrical
Section C408	Commissioning: Adds commissioning for service water heating systems over 200,000 btuh and for pools & spas. Also, adds 20 kW threshold for lighting system testing req	+ Add commissioning cost for boiler, pool & spa controls. Deletes lighting functional testing cost for most buildings under approx. 20,000 SF	+ Increases energy savings from commissioning boilers, pools & spas. Decreases savings from lighting functional testing in smaller buildings	Large bldgs w/ central service hot water or pools.	Water heating
Section C409 (new section)	Energy metering: Adds requirement for metering of source energy plus	**+** $5,000 - $14,000 for data collection & display system, two pulse outputs on utility	**+** 5% - 20% overall energy savings estimates from literature, use	Most bldgs over 20,000 SF	Electrical

	submetering of HVAC and water heating energy	meters, and two CTs (from Obvius survey of customers) Assume $10,000 average. (Note, higher cost estimates have been submitted and will be analyzed during cost & savings analysis.)	conservative 5% for analysis. Typ office building energy budget (electric plus gas) of $1.60/SF/YR X 50,000 SF = $80,000 x 5% savings = $4,000/YR		
Section C405.10	Escalators & moving walks: Requires new escalators to have variable speed function (or power factor controller) plus regenerative drive on "down" escalator	+ $6,500 or $13,500 per pair (depending on option chosen) or minimal cost from manufacturers who provide this standard on all escalators.	+ 25% - 60% escalator energy savings (6000 kWh – 21,000 kWh or $400 - $1500/YR savings), so use $1000 savings per pair. Maintenance same (or possibly lower)	Large transp, retail, office & assembly buildings	Escalator & moving walk
Section R406.2	Residential efficiency credits: Increases the number of required credits from 1.0 to 1.5	**+** Cost for additional credits will vary according to selection by owner	**+** Energy savings expected to be approximately 3.5%	All	Varies
C101.4.4	Change in occupancy or use: Change of occupancy to one that uses more energy (ie: garage to office or office to restaurant) must comply with the whole code.	**+** Under WSEC, this only applied for conversion to residential. This will especially impact conversion of unheated to heated space, but could also impact restaurant TI projects, data centers, clinics and others	**+** Where older buildings are upgraded for new uses, in the range of 30 – 50% of total EUI.	Alterations, change of use	Insulation, HVAC, electrical, lighting
C101.4.4	Change in occupancy or use: If use changes from one lighting power density category to another, comply with new LPD category	+ Cost varies widely, depending on whether this involves relamping of existing fixtures, or full replacement fixtures	+ Energy savings vary depending on degree of difference between old use and new.	Alterations, change of use	Lighting, electrical
C402.1.2 & Table 402.2	Mass walls & CMU walls: Did not carry over special values for mass walls & CMU walls from WSEC. U-values will reduce from 0.320 down to 0.078	**+** Additional costs for exterior insulation or interior frame wall + insulation	**+** Substantial energy use reduction – envelope heat loss will be about 1/3 or 1/4 of that of single-withe CMU walls	Buildings with CMU exterior walls	Masonry, insulation
C402.3.1	+ Prescriptive glazing area limit: Prescriptive glazing limit is 30%	+ No cost for most buildings, but higher cost for buildings	+ No change for most buildings, but lower	Buildings with large	Window, curtain wall,

	of the above-grade wall area (35% including skylights), instead of 40%, unless at least half of floor area is within a daylight zone (an unusual condition).	with more than 30% glazing, because they will need to do UxA tradeoff of TBP analysis	energy use for those buildings with more than 40% glazing area.	glazing area	insulation
C402.4.1.2.3	Air barrier testing requirement: Did not include exception for air barrier testing on additions smaller than 750 SF	+ Additional cost for small additions	+ Reduced heating and cooling energy	Alterations	Air barrier, testing
C402.4.7	Vestibules: Vestibules required at all public entrances, except those leading to spaces smaller than 3000 SF	**+** Additional cost for building area (50 – 100 SF) and second set of doors	**+** Reduced loss of conditioned air	All	Storefront
C403.2.10.1	Fan power allowance: Fan power allowance changes from unlimited in WSEC to IECC limits	**+** Additional cost for larger ductwork & air handler dimensions	**+** Significant Energy Savings from reduced fan energy	All	HVAC
C403.3	Simple system definition: Limits "simple systems" to a single zone controlled by a single T-stat	+ Smaller multi-zone systems no longer qualify as simple systems and must provide “complex systems” controls and economizers	+ Controls will provide better energy efficiency	All except small & simple projects	HVAC
C405.2.1.2	Lighting controls: Adds requirement for manual 50% light reduction controls for spaces without daylight or occupancy controls, sleeping units, and other room types.	+ Additional costs for circuiting &/or luminaire types to enable 50% light level reduction (for those spaces not exempted)	+ Allows spaces to operate at lower light level where desired by tenants	All	Lighting, electrical
C406	Additional efficiency packages: All projects must select one of the three higher-efficiency options: lighting controls, mechanical or site generated energy. (Note: a 4th option for a high-performance building envelope was added.)	**+** Additional cost for option selected by owner	**+** Savings will depend on option chosen and details of that solution.	All, except buildings undergoing TBP analysis	HVAC or lighting controls or solar/wind energy or fenestration & insulation

R101.4.4	Alterations – unheated to heated space: Requirement for spaces going from unheated to heated to come up to code completely	**+** May require upgrades to wall, window, door and slab edge, as well as lighting controls	**+** Savings may be extensive if existing space envelope (for garage, unheated basement, etc.) is uninsulated or poorly insulated.	Residential remodeling, conversion of unheated space to living space	Insulation, windows, doors, lighting
Section	**Changes with Limited Cost**	**Construction Cost Impacts**	**Energy Savings**	**Building Types**	**Trades Impacted**
Table C402 .2	Envelope requirements: Adjustment formula for continuous insulation that is penetrated by metal angles or clips, will increase effective U-value of insulation.	+ Clarifies meaning of code requirement. May result in increased thickness of continuous insulation and possible smaller mech system sizing	+ Reduced heat loss through envelope	All	Insulation
Table C402 .3	Window U-factor: Reduces min U-value for non-metal (wood or vinyl) windows in commercial construction from 0.32 to 0.30	+ (negligible) Proponent stated (and TAG agreed) that 0.30 is already the typical U-value for commercial wood & vinyl windows, because they qualify for Energy Star	+ $0.02 / SF / YR (estimate by proponent)	All	Window
C402.6	Refrigerated warehouses: Applies federal rules (for facilities under 3000 SF) to those over 3000 SF.	+ (slight) Most new facilities already comply, according to industry representatives	+ Brings some lower-performing installations up to current norms	Refrigerated warehouses	HVAC, Insulation, controls
Section C405.5.2	Interior LPA: Reduces lighting power allowances to ASHRAE 90.1 levels for several occupancy types	(-) Negligible or lower construction cost	+ Energy savings for some occupancy types	All	Lighting
Section C202	Daylighting: Requires daylighting controls for outer 20 feet of open parking garages	+Some cost for daylight sensors & controls + circuiting	+ $0.05 / SF / YR energy + reduced lamp replacement at daylight zones	Parking Garages	Lighting
Section C403.2.10	Fan motors: Motors below 1 HP – must have	+ A little more expensive to buy the higher efficiency	+ A little less energy use per motor	All	Electrical

	ECM or 70% efficiency, except fan coils or motors in certified equipment	motors			
Section C403.4.1	Economizers: Eliminates economizer exceptions 1, 3 & 4 (high IPLV chillers, contaminants in OSA, dehumidification)	+ These uses will need to provide economizers, or show savings via RS-29 analysis	+ Economizer efficiency will reduce energy use	All	HVAC
Section C403.2.6.1	Energy recovery ventilation: Exception from HRV requirement for multi-zone systems with less than 70% OSA	(-) Allows design flexibility and lower cost for larger HVAC systems	(-) (slight) May slightly decrease energy savings	Commercial with large multi-zone VAV	HVAC
Section C403.2.12.2	Large volume fan systems: Requires large single-zone fan systems to use variable speed or two-speed drives	+ $0.26 / SF cost for VSD or 2-speed drive ($1075 extra for 10 ton unit)	+ $0.04 - $0.05 / SF / YR, proponent's calculation	Commercial	HVAC
Section C405.2.3	Emergency lighting controls: Adds controls to shut off emergency light fixtures along with standard fixtures when space is unoccupied	+ $0.12 / SF Additional cost of listed occupancy sensors and relays for affected areas	+ $0.016 (1.6 cents) / SF / YR savings @ $0.07 / kWh, per CA Utilities Statewide Codes & Standards Team	Commercial	Lighting
Section C403.2.4.1.1	Heat pumps: Provides an exception for PTHP units to encourage use of that technology	(-) Removes a difficult (or impossible) requirement from PTHP design, so lowers construction cost	+ 2% better efficiency than PTAC. Encourages heat pump use, which is more efficient, thereby reducing energy use.	Multifamily	HVAC
Section C402.1	Component performance option: Adds target UA compliance path back into code. Adds design flexibility	(-) Potentially lowers costs by allowing designers to pick a more economical envelope design than prescriptive code without doing full systems analysis	-- No change in energy use	All	Architects, engineers
Section C401.2	Total building performance: Reduces difference between standard case and reference case for Total Bldg Perf method, from	(-) Encourages use of TBP method by making it more easily achievable, thus reduces cost for TBP	-- No change in energy use – assume that the 10% difference is taken up in the modeling "noise," not	All	Architects, engineers

	85% of std case to 90%		in actual energy use.		
Section C402.3.1.1	Daylighting controls: Exempts dwelling units from daylighting control requirements	(-) Reduces construction cost by eliminating daylight controls in multi-family	-- No energy use reduction since daylight controls are not being installed in residential now	Multifamily	Lighting
Section C403.2.6	Energy recovery ventilation: Exempts most multifamily from HRV requirement	(-) Reduces cost by eliminating HRV requirement for most multi-family	-- No energy use reduction since no one is currently installing HRV in apartments	Multifamily	HVAC
Section C403.3.1	Economizers: Adds an exception that encourages use of VRF systems in residential without having to follow TPB method	(-) Reduced design costs, since VRF can be used without a Total Bldg Performance analysis	+ Air source heat pumps are much more efficient at heating than gas or electric resistance heat	Multifamily	HVAC
Section R404.1	Lamps vs. luminaires: Change from luminaire efficacy to lamp type as basis for code. Allows std screw-base fixtures	(-) Reduced costs for more common light fixtures & lamps	-- No long-term energy use impact, since incandescent lamps are being phased out at the federal level	All	Lighting
C402.1.2 & Table 402.2	Envelope U-values: A few envelope values (for metal building walls & for Group R wood frame walls) more stringent than in WSEC Zone 1. (However, this is offset by the fact that 8 Eastern WA counties that are in WSEC Zone 2 will now be in the IECC Zone 5, which now has the same envelope requirements as IECC Zone 4.)	-- Little or no overall change in envelope costs or energy use	--		
C402.3	Window U-values: U value is 0.38 vs. WSEC 0.40 for fixed aluminum framed windows.	+ Slightly higher cost for higher-performing windows	+ Heat loss through metal-framed fenestration reduced by 5%	All bldgs w alum-framed windows	Window, curtain wall, storefront

	(Zone 6 is U-0.36 vs. WSEC 0.40)				
C402.3.2	Required Skylights: Skylights required in spaces with roofs over 10,000 SF in area and 15 feet ceiling height. Typically 3% of roof area	+ Additional construction cost for skylights and for daylight controls on light fixtures	+ Reduced lighting energy, slightly increased heating & cooling energy	Buildings with large open areas (see specific list of bldgs)	Skylight, roofing, lighting controls
C402.4	Air barriers & air barrier testing: Did not exempt buildings 5 stories and under from air barrier testing, and now clearly requires passing the test	+ Cost of air barrier (already common in most construction) and blower door testing	+ Reduced heating & cooling energy, 10% to 30%	All	Air barrier, insulation, testing
C402.4.5.2	Damper air leakage rate: 4 CFM max leakage rate instead of 10 cfm for outdoor air intake & exhaust dampers	+ Additional cost for dampers & controls	+ Reduced air leakage rate	All	HVAC
C403.2.3	Equipment efficiency: Base equipment efficiency higher than WSEC for some categories	+ This may (or may not) add cost, since the higher efficiencies are federal standards	+ Reduced energy for HVAC equipment	All	HVAC
C403.2.4.5	Snow melt controls: Auto shutoff required when air temp is above 40 and auto or manual shutoff when pavement temp is above 50	+ (slight) Adds cost of thermal sensors & switch	+ Prevents snow melt from being left on during warmer weather (or perhaps permanently)	Buildings with snow melt systems	Snow melt systems & controls
C403.2.7.3.2	Duct testing: Adds a "medium-pressure duct systems" category (2” – 3” w.g.) that require insulating & sealing	+ (slight) Some ducts that WSEC classified as low-pressure now have to pass somewhat more stringent pressure test	+ (slight) Less air leakage from medium-pressure ducts	All	HVAC
C403.4.3	Hydronic system controls: Requires controls to limit reheating and re-cooling of hydronic system fluids	+ Additional controls	+ Reduces waste of heating & cooling energy	All buildings w/ hydronic heating and cooling	HVAC
C403.4.3.3	Hydronic heat pumps: Hydronic heat pump systems in Zones 5 & 6: heat exchanger is	+ Heat exchanger & controls at cooling tower in Zones 5 & 6	+ Reduces heating energy waste	Zones 5 & 6 buildings w/ hydronic	HVAC

	required to isolate the cooling tower			heating & cooling	
C404.10.2	Pool heaters: Requires time switches on heaters for pools & permanent in-ground spas	+ (slight) Pool heater controls must include auto time switch, unless they have built-in timer	+ Can prevent pool heater from running during hours when not needed	Buildings with pools & in-ground spas	Pool & spa
C404.3 & 4	Water heaters Service water: heater temperature controls & heat traps	+ Heat traps for non-circulating systems, temperature setpoint controls	+ Reduces heat loss from piping at low-usage times, ensures that lower temp settings are possible	All	Plumbing
R402.4.1.2	Air leakage: With change in test standard, air leakage is reduced from (approx.) 5.5 ACH50 to 5.0 ACH50	-- Slight cost difference, since most homes meet this standard already	+ Savings estimate of approx. 1% of total home energy use	All	Envelope sealing
R402.4.2	Fireplace damper: Fireplaces must have tight-fitting damper and outdoor combustion air	+ Cost of damper and combustion air source	+ Reduction in heat lost up chimney & air infiltration during fireplace operation	Houses with fireplaces	Fireplace
R402.4.3	Fenestration air leakage: Door & window air leakage rate limits 0.3 cfm/SF for windows, 0.5 cfm for doors	+ May be additional cost for doors & windows labeled with tested air leakage rate. However, since envelope field testing is already required, the improved fenestration may make air barrier compliance easier	+ (slight) Overall envelope is already being tested anyway.	All	Window, door
R403.2.2.1	Air handler sealing: Air handlers must be sealed for max 2% leakage	+ Since the IECC is a national standard, all air handlers will soon be required to comply, so there may be no extra cost	+ Reduction in air leakage losses at air handler	All	H VAC
R403.5.1 Table	Fan efficacy: Ventilation fan efficacy limits	+ As a national standard, this requirement should become part of standard fan performance, so there may be no extra cost.	+ Reduced fan energy	All	HVAC

R403.8	Snow melt controls: Snow melt systems require auto shutoff when air temp is above 40 and auto or manual shutoff when pavement temp is above 50	+ (slight) Adds cost of thermal sensors & switch	+ Prevents snow melt from being left on during warmer weather (or perhaps permanently)	Homes with snow melt systems	Snow melt systems & controls
R403.9.2	Pool & spa controls: Requires time switches on heaters for pools & permanent in-ground spas	+ (slight) Pool heater controls must include auto time switch, unless they have built-in timer	+ Can prevent pool heater from running during hours when not needed	Homes with pools & in-ground spas	Pool & spa